

10.1 IMPACT OF SEVERE WEATHER WARNINGS ON THE HEARING IMPAIRED

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1. INTRODUCTION

Individuals with hearing disabilities have tremendous difficulty in receiving weather information during severe weather situations. Due to their hearing loss, they cannot hear tornado/emergency warning sirens or radio weather broadcasts. And, they have difficulty in gleaning weather information from television.

The purpose of this paper is to report the weather survey results on the impact of severe weather warnings on persons with hearing disabilities in Minnesota and Oklahoma.

2. SURVEY DISTRIBUTION AND RESPONSE

A confidential survey was developed in response to complaints by deaf and hard-of-hearing persons that they did not receive adequate weather warning information during periods of inclement weather. The survey documents not only how persons with hearing disabilities respond to severe weather warnings, but also the problems these people had in receiving emergency information.

Approximately 1330 questionnaires were distributed to Minnesota and Oklahoma deaf and hard-of-hearing residents via the state departments of rehabilitation services, regional agencies, workshops, and organizations serving for the deaf and hard of hearing. The mail survey was completed over an eight-month period (beginning September 1999). The response rate was 20.7%.

3. RESULTS AND DISCUSSION

3.1 Sources of weather warnings

The survey participants were asked how they found out about severe weather warnings. As shown in Fig. 1, television provides the easiest access to weather information needs. In general, they have become dependent upon television for help in planning their daily activities. Personal notification and *The Weather Channel*, respectively, are the second and third most common sources for weather information needs of the deaf and hard-of-hearing people.

"Personal notification" involves families, neighbors, co-workers, and/or friends who received severe weather warning information from television, radio, tornado/emergency warning siren, or word-of-mouth. These people then notified deaf and hard-of-hearing persons of severe weather warnings because of their concern that individuals with hearing disabilities might be not aware or inadequately informed of impending dangers associated with severe weather.

There are low response percentages of other sources beyond "personal notification (Fig. 1), probably indicating a

lack of interest in obtaining these sources. Also, there is a concern about the lack of NOAA Weather Radios. About three out of 100 of Minnesota respondents and seven out of 100 of Oklahoma respondents have the radios in their homes. A very small percentage of respondents with mild hearing loss are able to gather weather broadcasts from the radio. The majority of respondents with severe-to-profound hearing loss cannot understand weather broadcasts derived from the radios in vehicles and homes.

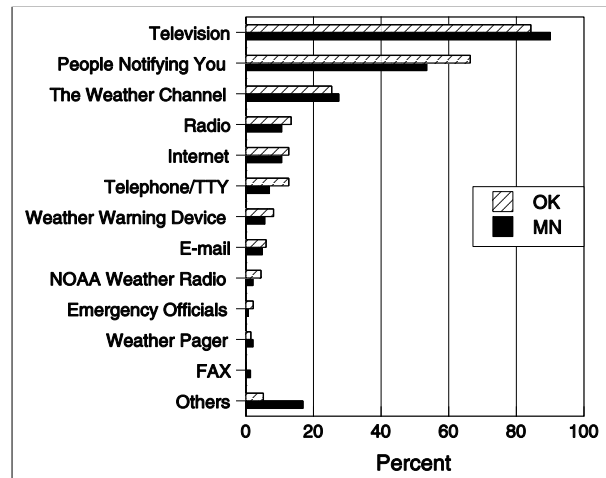


Fig. 1. Distribution of responses by various sources of severe weather warnings (in percent). MN stands for Minnesota; OK for Oklahoma.

Two problems that make it difficult for deaf and hard-of-hearing viewers to gather severe weather information from television are: (a) screen crawl (text used to scroll horizontally across the bottom part of a television screen for emergency notification) being covered up by *closed captioning*¹ of regular programming, and (b) no *real-time captioning*² of either routine hazardous weather segments during a regularly scheduled program or breaking-in special reports involving severe weather. Note that these segments are not scripted and the script is what usually appears in the closed captioning.

3.2 Blocked weather crawl

Seven out of ten of survey respondents expressed their frustrations when a weather crawl was blocked by closed cap-

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¹Captions or subtitles that are encoded (hidden) in the blanking interval of the TV signal, permitting persons with hearing disabilities to see what they cannot hear (Robson 1997).

²The simultaneous transmission of all spoken words in a live presentation as captions by a court reporter who is highly-skilled and specially-trained as a "stenocaptioner" (Robson 1997).

tioning. The respondents had trouble trying to read the crawl, partially or completely obscured by closed captioning. It is inappropriate to shut these viewers out of television weather warnings because, for their personal safety reasons, the viewers desperately needed to know where and when the threatening weather was occurring.

More than eight out of ten of respondents would like to see the screen crawl at the top of a television screen instead of along the bottom. The main reason is that the respondents did not want the closed captions to cover up the crawl or they missed a lot of important weather information. Local television stations can and should have the flexibility to place the crawl or even the closed captioning in different locations on the screen to minimize infringement on the captions or crawls.

3.3 Failure to hear the warning "beeps" on television

Local television stations normally interrupted programming with severe weather warnings by generating the "beeping" sounds that alerted viewers with normal hearing. They then scrolled a weather crawl along the bottom of a television screen. Participants with hearing disabilities were asked whether they missed a part of the weather information if they turned off the closed captioning. About seven out of ten of respondents admitted that they did not turn off closed captioning until well into the weather crawl. It occurred when the respondents were in another room where they did not hear the warning "beeps". By the time the respondents returned to their room where television was located, they missed an important part of the crawl when they noticed the crawl at a later time.

3.4 Lack of closed captioning of weather broadcasts

The lack of real-time captioning of either routine hazardous weather segments during a regularly scheduled program or breaking-in special reports involving severe weather presents another difficulty. Most local television stations did not offer this captioning because the captioning was expensive and labor-extensive. The proposition required a stenocaptioner to listen to an ad-libbing meteorologist's broadcast and write every word using a shorthand machine (Robson 1997). The words then were instantaneously transmitted with the television receiver and decoded by television sets equipped for closed captioning. A caption decoder or television extracted the closed-captioned information and turned it into visible subtitling within a few seconds.

Participants were asked whether they favored having real-time captioning of hazardous local weather broadcasts and of *The Weather Channel*. The survey showed that eight out of ten of respondents expressed their strong desire to have all weather broadcasts captioned in real time for the following reason. Real-time captioning of emergency weather information broadly ensures that the information which affects the safety of viewers is available to deaf and hard-of-hearing persons with the same immediacy as it is for viewers with normal hearing. Note that *The Weather Channel* inaugurated real-time captioning in December 1999 while the survey responses were being compiled. The closed captioning format was carefully designed to minimize infringement on the weather maps and graphics that are essential to *The Weather Channel's* overall programming picture. The position of *The Weather Channel's* closed captioning also allows any local

severe weather crawls to be viewed unobscured. However, none of the local information is available for those who are not served by cable. Viewers of *The Weather Channel* via satellite get no local information.

3.5 Insecurity

Participants were asked if they felt unsafe during storm hazards when they did not receive enough weather information. Eight out of ten of respondents felt unsafe at least some of the time. The lack of (a) closed captioning of hazardous weather broadcasts, (b) severe weather education, and (c) NOAA Weather Radio (see section 5) in their homes are the reasons for causing insecurity. The most fear for persons with hearing disabilities as well as the hearing persons is the approach of a tornado late at night, when most people are sleeping. Individuals having normal hearing must rely on a local siren or NOAA Weather Radio alarm tone to wake them up so that they seek shelter.

3.6 Types of weather hazards

The survey participants were asked what types of weather information they needed for their personal safety reasons. The survey responses are shown in Fig. 2. The prevalence of desired weather information is greater for ice storm, tornado, and thunderstorm associated with hail and lightning than for flood/flash flood, hurricane, and heat wave. More than eight out of ten of Minnesota respondents needed to learn about the blizzard hazards, compared to four out of ten of Oklahoma respondents. The low (high) frequency of blizzards in Oklahoma (Minnesota) is a contributing factor to the low (high) response of the Oklahoma (Minnesota) persons. The prevalence of hurricanes is small for those respondents planning a beach or tropical vacation and needing to know what to do should they get caught in a hurricane. Severe weather education is recommended for deaf and hard-of-hearing persons needing to understand the basic weather knowledge.

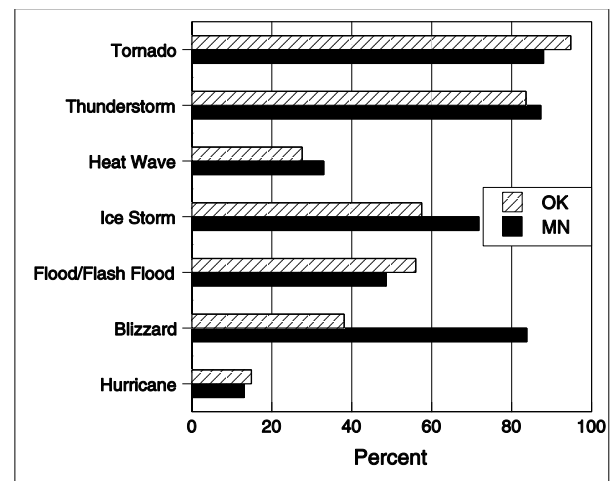


Fig. 2. Distribution of responses by various types of desired weather information (in percent). MN stands for Minnesota; OK for Oklahoma.

There is a concern that persons with hearing disabilities show their apathy about flood/flash flood and heat wave hazards, as indicated by the low response in Fig. 2. Appar-

ently, the respondents did not receive or know how to use the hazard information. Perhaps they did not place the same significance on flooding as on tornadoes, even though floods killed twice as many people each year. Heat is the number 1 weather-related cause of death for U.S. residents (about 1000 per year), according to Changnon et al. (1996).

3.7 Basic safety rules

Fig. 3 presents the response percentage of the respondents' knowledge of severe weather safety rules. Tornado safety rule is the most important with thunderstorm safety rule being the second most important. Less than six out of ten of respondents know the safety rules for heat wave, ice storm, flood/flash flood, and hurricane. Interestingly, the blizzard safety rule is the third most important to the Minnesota respondents, compared to the sixth most important to the Oklahoma respondents. The obvious explanation for the disparity is that Minnesota had extensive disaster preparedness plans for blizzards, owing to the highly common nature of blizzards. Oklahoma did not have such plans.

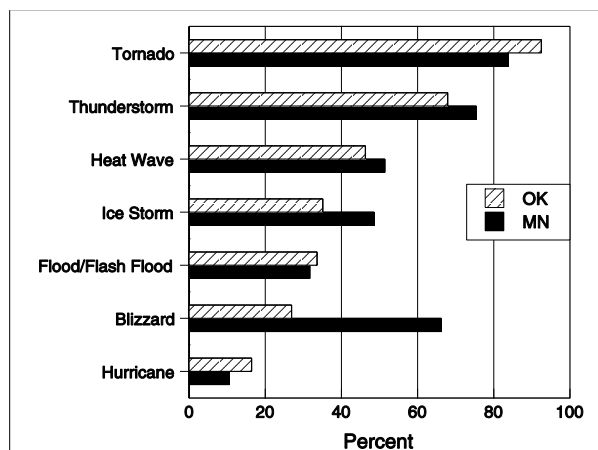


Fig. 3. Distribution of responses by various types of safety rules (in percent). MN stands for Minnesota; OK for Oklahoma.

Respondents were asked where they received basic weather safety rules. Six out of ten of Oklahoma respondents obtained the storm safety information from television, compared to two out of ten of Minnesota respondents (Fig. 4). The apparent explanation for the difference is that it is not uncommon for Oklahoma respondents in high-risk regions frequented by severe weather to obtain severe weather safety rules from their local news program. Other sources of safety rules, in descending order of popularity, were pamphlets, National Weather Service, American Red Cross, Internet, emergency officials, and others.

3.8 Preparedness plans

Developing contingency plans for potential weather hazards is critical to minimizing the risk of injury or fatality. Fig. 5 shows that six out of ten of respondents have their preparedness plans for weather emergencies, compared to three out of ten of respondents who do not have (Fig. 5). It is strongly recommended that those who do not have such plans are urged to review the basic safety information and

prepare for all weather hazards that affect their areas and themselves.

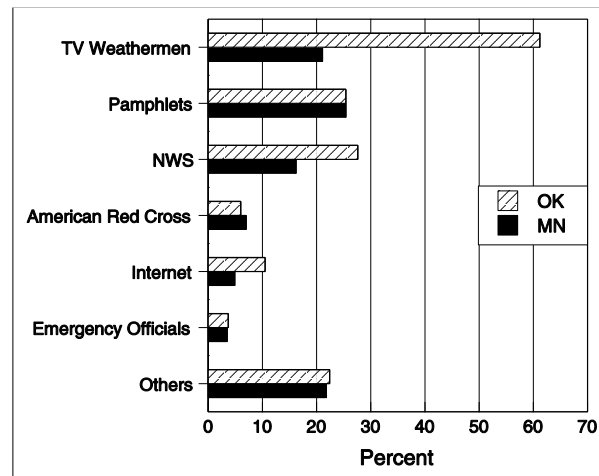


Fig. 4. Distribution of responses by various sources of weather safety information (in percent). MN stands for Minnesota; OK for Oklahoma.

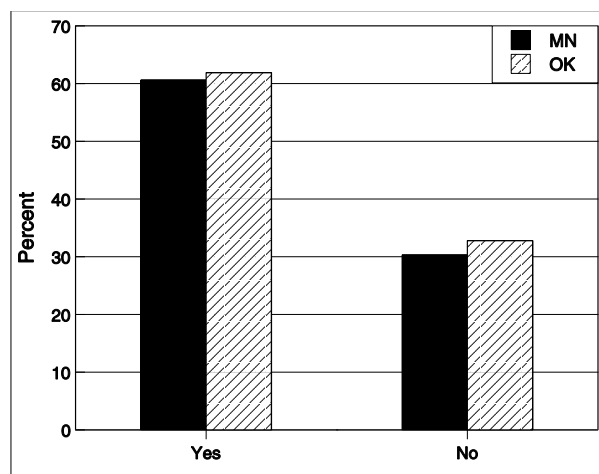


Fig. 5. Distribution of responses by weather emergency plans (in percent). MN stands for Minnesota; OK for Oklahoma.

3.9 Respondents' suggestions and ideas

Survey respondents were asked to share with us their ideas and suggestions to improve the weather information. Overall, the majority of the respondents want to have all weather broadcasts captioned in real time. A small percentage of respondents would like to have NOAA Weather Radio activated with a horn or strobe light or bed vibrator. Also, the respondents who are unable to glean weather broadcasts from NOAA Weather Radio want the radio to convert digital data to printed weather information (e.g., Campbell 1995). A few other respondents suggest the placing of a strobe light on top of the Civil Defense siren.

4. SUMMARY

A survey of 276 questionnaires revealed that there is a hole in our severe weather warning system: the lack of access to severe weather information by persons with hearing disabilities in Minnesota and Oklahoma. There are four problems that cause the hole: (a) the covering up of weather crawls by closed captioning, (b) the lack of real-time captioning of hazardous weather broadcasts during times of severe weather, (c) the lack of NOAA Weather Radio, and (d) the lack of severe weather education. These problems lead the majority of persons with hearing disabilities to rely on watching the menacing sky in times of severe weather or become entirely dependent on their families/relatives/friends/co-workers having normal hearing. This creates an extra link to get the severe weather warning information to persons with hearing disabilities that adds extra time before action is taken.

According to the *Wall Street Journal* on 13 April 2000, the Federal Communications Commission (FCC) ordered broadcasters, cable companies, and other distributors of television programs to flash local emergency information to persons with hearing disabilities in the event of floods, fires, earthquakes, weather hazards, or disasters under new rules adopted by the FCC. That can be accomplished through real-time closed captioning, open captioning, scrolling words or some other means. The rules come after numerous complaints that persons with hearing disabilities nearly lost their lives during storm hazards because the weathercasts did not carry closed captioning.

5. RECOMMENDATIONS

Based on Figs. 2-5, it is strongly recommended that persons with hearing disabilities get better educated about the threat and danger of various weather hazards, to understand the severe weather warning process, to follow basic safety rules, and to develop action plans for severe weather emergencies. Each year prior to severe weather season, weather experts make a training of the deaf and hard-of-hearing communities on severe weather hazards. Under the Americans with Disabilities Act (ADA), the persons holding the seminars or workshops are responsible for reserving and paying for interpreters. Closed-captioned NOAA videos of severe weather hazards can be helpful for deaf and hard-of-hearing persons to see what they cannot hear. Also, there are many excellent weather education sources containing detailed information on various types of severe weather hazards on the Internet. Preparedness is a key element in ensuring that injury and property damage is minimized during severe weather. And most importantly, it is each and every person's responsibility to do so.

Persons with hearing disabilities living in high-risk regions are encouraged to wear a weather pager. The pager is probably the best life-saving device against severe weather hazards (Wood 1997). When local National Weather Service offices issue the text broadcasts of weather watches and warnings, the pager activates vibration and displays a text message that can be easily read. The pager is ideal as a notification method for these persons who cannot afford to be tied down to a computer or weather data source or television without worrying about severe weather catching them off guard and unaware.

A newly released Weather Alert Radio has been designed for alerting persons with hearing disabilities and has

recently been placed on the market. The radio is capable of alerting persons of weather hazards by activating a bed vibrator, a horn, or a light indicator. The following Web sites are: <http://www.silent-call.com/> and <http://www.harriscomm.com/>.

6. ACKNOWLEDGMENTS

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